IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1.(original) A one-piece cylindrical seamless master having an integral light-shaping diffuser surface on a surface portion thereof, wherein the cylindrical master defines a longitudinal axis and is rotatable thereabout.

2.(original) The one-piece cylindrical seamless master of claim 1, wherein the seamless master is hollow, longitudinally-elongated and defines an interior circumferential surface.

3.(original) The one-piece cylindrical seamless master of claim 2, wherein the hollow seamless master has a radial thickness of about 0.02 inches.

4.(original) The one-piece cylindrical master of claim 1, wherein the master, when rotated about its longitudinal axis, is used to produce a seamless light-shaping diffuser.

5.(original) The one-piece cylindrical seamless master of claim 1, wherein the seamless master is made of a hard metal.

6.(original) The one-piece cylindrical seamless master of claim 2, wherein the seamless master is made of plated nickel.

7.(original) The one-piece cylindrical seamless master of claim 1, wherein the one-piece seamless master is hollow, longitudinally-elongated and defines an interior circumferential surface, wherein the hollow, longitudinally-elongated seamless master has a radial thickness of about 0.02 inches, wherein the longitudinally-elongated seamless master, when rotated about its longitudinal axis, is used to produce a seamless light-shaping diffuser, wherein the seamless master is made of a hard metal, and wherein the hard metal is plated nickel.

8.(original) A one-piece cylindrical seamless master formed by a method, the method comprising the steps of:

(1) radially mounting onto an exterior circumferential surface portion of a cylindrical element a unitary hollow cylindrical layer of elastomeric material defining an exterior circumferential surface and having an integral light-shaping diffuser surface on the exterior circumferential surface thereof, wherein the light-shaping diffuser surface defines preselected speckle patterns and resultant transversely-disposed and longitudinally-disposed geometrical shapes having preselected radial dimensions;

(2) intimately contacting the exterior circumferential surface of the unitary elastomeric material layer with an effective amount of a coating of a first metal, wherein the first metal coating defines an exterior circumferential surface and an interior circumferential surface that is in intimate contact with the exterior circumferential surface of the hollow cylindrical elastomeric material layer, and wherein the first metal coating is in an amount and is radially dimensioned, relative to the exterior circumferential surface of the hollow cylindrical elastomeric material layer, such that the light-shaping diffuser surface is substantially reproducibly transferred from the exterior circumferential surface of the hollow cylindrical elastomeric material layer, to the exterior circumferential surface of the first metal coating;

(3) intimately contacting the exterior circumferential surface of the first metal coating with a layer of a second metal, wherein the second metal is passivatable, wherein the second metal layer defines an exterior circumferential surface and an interior circumferential surface that is in such intimate contact with the exterior circumferential surface of the first metal coating that the light-shaping diffuser surface is substantially reproducibly transferred radially from the exterior circumferential surface of the first metal coating to the interior circumferential surface of the passivatable second metal layer;

(4) separating the cylindrical element and the hollow cylindrical elastomeric material layer from the second metal layer, whereupon the light-shaping diffuser surface is substantially reproducibly transferred radially from the exterior circumferential surface of the first metal coating to the interior circumferential surface of the passivatable second metal layer;

(5) passivating the interior circumferential light-shaping diffuser surface of the second metal layer;

(6) intimately contacting the interior circumferential light-shaping diffuser surface of the second metal layer with a layer of a third metal, wherein the third metal layer is cylindrical and defines an interior circumferential surface and an exterior circumferential surface that is in such intimate contact with the interior circumferential light-shaping diffuser surface of the second metal layer that the light-shaping diffuser surface of the second metal layer is substantially reproducibly transferable radially to the exterior circumferential surface of the cylindrical third metal layer; and

(7) separating the passivated second metal layer from the cylindrical third metal layer, whereupon the light-shaping diffuser surface of the second metal layer is substantially reproducibly transferred radially from the interior circumferential surface of the second metal layer to the exterior circumferential surface of the cylindrical third metal layer.

9.(original) The seamless master of claim 8, wherein the unitary hollow cylindrical layer of elastomeric material has a radial thickness of about 1/16 inches to about 1/8 inches.

10.(original) The seamless master of claim 9, wherein the first metal coating is silver.

11.(original) The seamless master of claim 8, wherein the second metal layer is plated nickel.

12.(original) The seamless master of claim 11, wherein the plated nickel layer is unitary, longitudinally-elongated, hollow and cylindrical, and wherein the plated nickel layer has a radial thickness of about 5 / 1000 inches to about 10 / 1000 inches.

13.(original) The seamless master of claim 8, wherein the third metal layer is plated nickel.

14.(original) The seamless master of claim 13, wherein the plated nickel layer is unitary, longitudinally elongated, and has a radial thickness of about 0.020 inches.

15.(original) Apparatus for effecting variable diffuser recording in photosensitive medium, comprising:

a base;

a source of coherent light spaced from the base;

an elongated mechanism, mounted on the base and defining an axis of rotation spaced from the base;

a cylindrical member rotatably mounted on the mechanism;

a layer of photosensitive medium on the external circumferential surface of said cylindrical member, whereby rotation of the cylindrical member about the axis of rotation of the mechanism, relative to the base and in the presence of the coherent light, is for causing the layer of photosensitive medium on the external circumferential surface of the cylindrical member to become exposed;

an optical objective device, spaced from the base and located intermediate the source of coherent light and the cylindrical member, for affecting the cross-sectional area of the coherent light therebetween;

an optically light-transmissive diffuser, carried by the base and located intermediate the optical objective device and the cylindrical member, for diffusing and imparting a preselected speckle pattern to the affected cross-sectional area of coherent light; and

a blocker defining an aperture of preselected dimensions, wherein the blocker is carried by the base and is so oriented intermediate the diffuser and the cylindrical member, as to be used for effecting exposure of a preselected portion of the layer of photosensitive medium on the external circumferential surface of the cylindrical member.

16.(original) The apparatus of claim 15,

wherein a first length is defined as the distance traveled by the coherent light between the optical objective device and the diffuser,

wherein a second length is defined as the distance traveled by the coherent light between the diffuser and the layer of photosensitive medium on the external circumferential surface of the cylindrical member, and

wherein a third length is defined as the distance traveled by the coherent light between the layer of photosensitive medium on the cylindrical member and the blocker,

whereupon any one of the first, second, and third lengths is changed relative to any other one of said lengths, for effecting variable diffuser recording in the photosensitive medium.

17.(original) The apparatus of claim 15, wherein the optical objective device includes at least one of a magnifying lens, a spherical lens, a cylindrical lens, an elliptical lens, and combinations thereof, for providing at least one of a magnification component, a cylindrically-elongated component, an elliptically-elongated component, and combinations thereof, respectively associated therewith, to the cross-sectional area of coherent light.

18.(original) The apparatus of claim 15, wherein the optically light-transmissive diffuser is a holographic diffuser.

19.(original) The apparatus of claim 15, wherein the blocker is of generally planar construction, wherein the blocker is orientated generally normal to the path of the coherent light, and wherein the aperture is generally rectangular and has a width ranging from about 3 inches to about 10 inches and a height of about 4 inches.

20.(original) A process for effecting variable diffuser recording in photosensitive medium, comprising the steps of:

providing an elongated cylindrical member defining a longitudinal axis and rotatable thereabout, wherein the cylindrical member includes a layer of photosensitive medium on the external circumferential surface thereof;

directing a coherent light beam produced by a source of coherent light toward the photosensitive medium;

interposing an optical objective device between the coherent light beam and the photosensitive medium;

interposing an optically light-transmissive diffuser between the optical objective device and the photosensitive medium;

interposing a blocker defining an aperture of preselected dimensions in the coherent light beam between the optically light-transmissive diffuser and the photosensitive medium; and

changing the distances between the diffuser and the optical objective device, or diffuser and layer of photosensitive medium, or blocker and layer of photosensitive medium, for effecting variable exposure of the layer of photosensitive medium.

21.(original) The process of claim 20, further including the steps of:

rotating the cylindrical members through a preselected angle about its elongated axis,

exposing a portion of the layer of photosensitive medium to the coherent light beam for a preselected period of time, thereby exposing said portion of photosensitive medium,

continuing to rotate the cylindrical member through said preselected angle in the presence of the coherent light beam for exposing a circumferential band of the photosensitive medium on the cylindrical member, wherein said circumferential band is defined as a circumferential portion of the lengthwise circumferential exterior surface of the photosensitive medium on the cylindrical member;

moving one of the light source and the cylindrical member a preselected distance laterally relative to the other; and

repeating the above-recited steps until the entire circumferential exterior surface of the layer of photosensitive medium is exposed.

22.(original) The method claim 21, wherein the optical objective device includes at least one of a magnifying lens, a spherical lens, a cylindrical lens, an elliptical lens, and combinations thereof, for providing at least one of a magnification component, a cylindrically-elongated component, an elliptically-elongated component, and combinations thereof, respectively associated therewith, to the cross-sectional area of coherent light,

and further including the step of changing the components of the optical objective device, after completing the moving step prior to completely exposing the photosensitive medium, for effecting variable diffuser recording in the photosensitive medium.

23.(canceled) A method of making a one-piece hollow cylindrical invertable elastomeric master, comprising the steps of:

(1) applying an effective amount of a liquid curable photosensitive medium to an external circumferential surface of an elongated cylindrical member defining a longitudinal axis and rotatable thereabout, and rotating the cylindrical member about its longitudinal axis for forming substantially along the length and exterior circumferential surface thereof a seamless layer of curable photosensitive medium of substantially uniform radial dimension;

(2) curing the layer of photosensitive medium on the elongated cylindrical member;

(3) subjecting the cured layer of photosensitive medium substantially along the length and exterior circumferential surface thereof to a source of coherent light that has had preselected speckle imparted thereto and rotating the cylindrical member about its longitudinal axis, to expose the photosensitive medium and to

produce an associated predetermined speckle pattern in the exposed photosensitive medium substantially along the length and exterior circumferential surface of the photosensitive medium on the cylindrical member in an irregular manner, whereupon the exposed photosensitive medium is subsequently able to be developed;

(4) developing the exposed photosensitive medium, for fixing the irregularly exposed areas of the photosensitive medium as physical microstructures in the medium;

(5) applying along the length and exterior circumferential surface of the developed photosensitive material an effective amount of a curable elastomeric liquid and curing the elastomeric liquid, to produce an elongated hollow cylindrical elastomeric member of predetermined radial dimension that is in intimate contact with the speckle pattern recorded in the photosensitive material, thereby producing in the elastomeric member a seamless light-shaping diffuser surface where the elastomeric member is in intimate contact with the speckle pattern, wherein the hollow cylindrical elastomeric member is invertable;

(6) separating the invertable hollow cylindrical elastomeric member from the developed photosensitive material having the speckle pattern recorded therein, whereupon the invertable hollow cylindrical elastomeric member has the seamless light-shaping diffuser surface substantially along the length and inner circumferential surface thereof; and

(7) inverting the hollow cylindrical elastomeric member, for presenting the seamless light-shaping diffuser surface substantially along the length and exterior circumferential surface thereof, thereby producing the hollow cylindrical elastomeric master.

24.(canceled) The method of claim 23, wherein the photosensitive medium has a radial thickness of about one micron to about one hundred microns.

25.(canceled) The method of claim 23, wherein the photosensitive medium has a radial thickness of about thirty-five microns.

26.(canceled) The method of claim 23, wherein curing of the photosensitive medium is effected by baking said medium at elevated temperature for about forty minutes to about two hours.

27.(canceled) The method of claim 23, wherein curing of the photosensitive medium is effected by baking said medium at about 90 degrees C for about one hour to about two hours.

28.(canceled) The method of claim 23, wherein curing of the photosensitive medium is effected by baking said medium at about 65 degrees C for about one hour.

29.(canceled) The method of claim 23, wherein the exposed photosensitive medium is developed by contacting said medium with an effective amount of a 10 weight % aqueous developer solution for a period of time ranging from about thirty seconds to about one minute.

30.(canceled) The method of claim 23, wherein the elastomeric liquid is cured by subjecting said elastomeric liquid to room temperature for a time period of about twenty-four hours.

31.(canceled) The method of claim 23, wherein the hollow cylindrical elastomeric member has a radial thickness of about 1 / 16 inches to about 1 / 8 inches.

32.(original) A one-piece hollow cylindrical invertable elastomeric master, made by a method comprising the steps of:

(1) applying an effective amount of a liquid curable photosensitive medium to an external circumferential surface of an elongated cylindrical member defining a longitudinal axis and rotatable thereabout, and rotating the cylindrical member about its longitudinal axis, for forming substantially along the length and exterior circumferential surface thereof a seamless layer of curable photosensitive medium of substantially uniform radial dimension;

(2) curing the layer of photosensitive medium on the elongated cylindrical member;

(3) subjecting the cured layer of photosensitive medium substantially along the length and exterior circumferential surface thereof to a source of coherent light that has had preselected speckle imparted thereto and rotating the cylindrical member about its longitudinal axis, to expose the photosensitive medium and to produce an associated predetermined speckle pattern in the exposed photosensitive medium substantially along the length and exterior circumferential surface of the photosensitive medium on the cylindrical member in an irregular manner, whereupon the exposed photosensitive medium is subsequently able to be developed;

(4) developing the exposed photosensitive medium, for fixing the irregularly exposed areas of the photosensitive medium as physical microstructures in the medium;

(5) applying along the length and exterior circumferential surface of the developed photosensitive material an effective amount of a curable elastomeric liquid and curing the elastomeric liquid, to produce an elongated hollow cylindrical elastomeric member of predetermined radial dimension that is in intimate contact with the speckle pattern recorded in the photosensitive material, thereby producing in the elastomeric

member a seamless light-shaping diffuser surface where the elastomeric member is in intimate contact with the speckle pattern, wherein the hollow cylindrical elastomeric member is invertable;

(6) separating the invertable hollow cylindrical elastomeric member from the developed photosensitive material having the speckle pattern recorded therein, whereupon the invertable hollow cylindrical elastomeric member has the seamless light-shaping diffuser surface substantially along the length and inner circumferential surface thereof; and

(7) inverting the hollow cylindrical elastomeric member, for presenting the seamless light-shaping diffuser surface substantially along the length and exterior circumferential surface thereof, thereby producing the hollow cylindrical elastomeric master.

33.(original) The one-piece hollow cylindrical invertable elastomeric master of claim 32, wherein the photosensitive medium has a radial thickness of about one-micron to about one hundred microns.

34.(original) The one-piece hollow cylindrical invertable elastomeric master of claim 32, wherein the photosensitive medium has a radial thickness of about thirty-five microns.

35.(original) The one-piece hollow cylindrical invertable elastomeric master of claim 32, wherein curing of the photosensitive medium is effected by baking said medium at elevated temperature for about forty minutes to about two hours.

36.(original) The one-piece hollow cylindrical invertable elastomeric master of claim 32, wherein curing of the photosensitive medium is effected by baking said medium at a temperature of about 90 degrees C for about one hour to about two hours.

37.(original) The one-piece hollow cylindrical invertable elastomeric master of claim 32, wherein curing of the photosensitive medium is effected by baking said medium at a temperature of about 65 degrees C for about one hour.

38.(original) The one-piece hollow cylindrical invertable elastomeric master of claim 32, wherein the exposed photosensitive medium is developed by contacting said medium with an effective amount of a 10 weight % aqueous developer solution for a period of time ranging from about thirty seconds to about one minute.

39.(original) The one-piece hollow cylindrical invertable elastomeric master of claim 32, wherein the elastomeric liquid is cured by subjecting said elastomeric liquid to room temperature for a time period of about twenty-four hours.

40.(original) The one-piece hollow cylindrical invertable elastomeric master of claim 32, wherein the hollow cylindrical elastomeric member has a radial thickness of about 1/16 inches to about 1/8 inches.